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Inter-Industry FDI Spillovers from
Foreign Banks: Evidence in Transition
Economies



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Keywords: FDI spillovers; foreign banks; services FDI; innovation

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1. INTRODUCTION

How foreign direct investment (FDI) influences domestic firms' performance is an important question because answering it can help policymakers decide how open their countries should be to FDI. Generally speaking, FDI possesses advanced knowledge that can be transferred to domestic firms. Several studies argue that domestic firms are likely to benefit also from FDI in other industries, leading to positive inter-industry FDI spillovers (e.g., Javorcik, 2004; Meyer, 2004; Wei and Liu, 2006; Blalock and Gertler, 2008; Blalock and Simon, 2009).¹

However, inter-industry spillovers from FDI in the tertiary (services) sector of industry (henceforth, "services FDI") have received scant empirical examination.² This is surprising, given the upward trends in services FDI in recent years (Baden-Fuller, 2014). Importantly, the current literature suffers from two limitations. First, prior studies focus only on the impact of the aggregate of services FDI so we do not know if FDI in a particular service industry creates positive inter-industry spillovers. Second, prior studies have not sufficiently explored moderators that can explain when positive inter-industry spillovers from service FDI would be stronger or weaker.

To address these limitations, this study examines inter-industry spillovers from FDI in the banking sector, namely the impact of foreign bank penetration on the innovation activities of non-financial domestic firms in transition economies, and the boundary conditions for this relationship.³ The banking industry in many transition economies has experienced strong FDI growth over the past few decades (Berger, 2007; Poghosyan and Poghosyan, 2010). However, studies on FDI spillovers from foreign banks focus on intra-industry, rather than inter-industry, spillovers, which represents the gap for our study to fill.

Although the findings on the impact of foreign bank penetration on the overall credit access in host countries are mixed (e.g., Clarke, Cull, and Peria, 2006; Detragiache, Tressel, and Gupta, 2008; Giannetti and Ongena, 2009; Gormley, 2010; Lin, 2011; Claessens and Van Horen, 2014), we argue that foreign bank penetration can still increase domestic firms' innovation through channels not directly related to credit granting. For example, foreign banks may improve domestic firms' access to international banking services and global business matchmaking, which can help domestic firms acquire international knowledge.

We further examine the conditions under which the effects of foreign bank penetration on domestic firms' innovation may vary. First, positive spillovers from foreign banks using relationship lending may be stronger than those using transaction lending. This is because foreign relationship banks tend to have a

¹ Positive inter-industry FDI spillovers occur when the performance of domestic firms improves because FDI exists in a different industry and the value of such performance increase is not fully appropriated by the FDI itself (Javorcik, 2004; Meyer, 2004).

² With only a few exceptions (e.g., Arnold, Javorcik, and Mattoo, 2011; Fernandes and Paunov, 2012; Mariotti, Nicolini, and Piscitello, 2013; Orlic, Hashi, and Hisarcikilar, 2018).

³ Although many studies examine domestic firms' productivity as an outcome of FDI spillovers, we study innovation because scholars suggest that innovation may be a more immediate outcome (Branstetter, 2006, Liu and Buck, 2007). Also, knowledge about products and markets, albeit important for innovation, may not always be related to productivity (Salomon and Shaver, 2005).

greater willingness and ability to transfer knowledge to client firms. Second, domestic exporters, compared to non-exporters, tend to benefit less from foreign bank penetration because they are less dependent on foreign banks for access to international knowledge. Third, positive spillovers from foreign banks may be weaker in countries that are more open to the global market. In these countries, it may be less important for foreign banks to provide access to international knowledge because international knowledge is frequently circulated within the country (Xie and Li, 2018).

We test our hypotheses using a sample of 18,058 non-financial domestic firms across 27 transition economies from Eastern Europe and Central Asia. The analyses provide strong support for our predictions. Economically, we find that if the share of foreign bank branches in a city increases by 30% (approximately one standard deviation), on average, a domestic firm in the same city is approximately 21% more likely to engage in product innovation. Our analyses also reveal that foreign bank penetration does not significantly improve domestic firms' access to bank credit but does increase their likelihood of licensing foreign technology, suggesting that the positive inter-industry spillovers from banking FDI are likely to occur through non-credit channels.

Overall, this study makes four major contributions. First, although services FDI may be the most likely source of spillovers to domestic firms in downstream industries, the literature on inter-industry spillovers from services FDI is still in its infancy (Javorcik, 2008). Both theoretical and empirical studies focus on the aggregate of services FDI, thereby masking differences across industries. In contrast, our study specifically advances knowledge about inter-industry spillovers from banking FDI. Unique features of the banking industry such as extensive interaction with clients and provision of banking services that facilitate international transactions may make spillovers from banking FDI prominent. Thus, our study has an important implication for future research on services FDI spillovers.

Second, we respond to the call of some scholars to examine the conditions under which positive FDI spillovers are more likely (e.g., Meyer, 2004; Javorcik, 2008). This is especially important for extending the literature on inter-industry spillovers from services FDI, where most studies focus only on the existence of spillovers. An exception is a study by Mariotti, Nicolini, and Piscitello (2013) that investigates how two characteristics of domestic firms, absorptive capacity and foreign involvement, influence the extent to which these firms benefit from services FDI. Nevertheless, scholars suggest that the characteristics of FDI and the institutional environments of the host country are important boundary conditions for positive FDI spillovers (Meyer, 2004; Sinani and Meyer, 2004; Meyer and Sinani, 2009). We thus advance the literature by considering a characteristic of FDI (i.e., the lending strategies of foreign banks) and the host country's institutional environments (i.e., the openness of the host country) as boundary conditions for positive inter-industry spillovers from banking FDI.

Third, our study advances the banking literature. The conventional wisdom is that banks influence non-financial firms' innovation by providing these firms with credit (see Lin, Liu, and Wei, 2018, for a review). Therefore, most studies focus on whether financial systems are sufficiently developed and efficient so that firms can gain access to the bank credit for undertaking innovation (e.g., Schumpeter, 1934; King and Levine, 1993; Beck, Levine, and Loayza, 2000; Alfaro, Chanda, Kalemli-Ozcan, and Sayek, 2004). However, we find that banks may enhance firms' innovation without improving their access to bank credit, implying the existence of non-credit channels. We theorize that foreign banks may foster domestic firms' innovation by providing services that help firms acquire international knowledge. Overall, our study is important because it suggests that scholarly attention should not be limited to credit, the core product in the banking industry, when investigating the roles of banks in firm innovation.

Last, we advance the debate on whether banking FDI is beneficial for the overall welfare of host countries. Studies largely focus on whether foreign bank penetration improves domestic banks' performance (e.g., Claessens, Demirgüç-Kunt, and Huizinga, 2001; Lensink and Hermes, 2004) and domestic firms' overall credit access (e.g., Clarke, Cull, and Peria, 2006; Detragiache, Tressel, and Gupta, 2008; Gormley, 2010; Lin, 2011; Claessens and Van Horen, 2014). However, the empirical evidence is inconclusive, leading to an ongoing debate (Dages, Goldberg, and Kinney, 2000). In transition economies, domestic markets become more open and competitive along with a variety of liberalization policies. If domestic firms can catch up through productivity growth and innovation, their countries' long-term economic performance will eventually improve, benefiting many other citizens (Romer 1990; Helpman, 1992). Our study therefore provides new evidence on the merits of opening the door to banking FDI.

2. INTER-INDUSTRY SPILLOVERS FROM SERVICES FDI

Scholars have long been interested in the relation between FDI and domestic firms' performance, especially in productivity (e.g., Aitken and Harrison, 1999; Sinani and Meyer, 2004; Blalock and Simon, 2009) and innovation (e.g., Buckley, Clegg, and Wang, 2002; Branstetter, 2006; Liu, Lu, Filatotchev, Buck, and Wright, 2010; Wang and Wu, 2016). This issue is important for most, if not all, countries as innovation and productivity are the main drivers of long-term economic growth (Romer, 1990; Helpman, 1992). A widely held belief is that FDI possesses different and advanced technology, management know-how, marketing skills, and other knowledge that can compensate for firms' liability of foreignness (Zaheer, 1995). Domestic firms can benefit from FDI if they can gain access to foreign firms' knowledge, for example, by collaborating with foreign firms (Blomström and Kokko, 1998) and by hiring employees trained by foreign firms (Gamble, 2011). This is particularly attractive for domestic firms in transition economies because they are eager to improve their competitiveness in an increasingly open and competitive market (Estrin, 2002). Nevertheless, FDI poses strong competition to domestic firms operating in the same industry.

Although competition may motivate domestic firms to be more efficient and productive to survive (Blomström and Kokko, 1998), it may also crowd out domestic firms and suppress the willingness of foreign firms to transfer their knowledge to domestic firms (Aitken and Harrison, 1999).

Because competition is much less significant across industries, scholars suggest that FDI may be more beneficial for domestic firms in different industries (e.g., Javorcik, 2004; Meyer, 2004; Wei and Liu, 2006; Blalock and Gertler, 2008; Blalock and Simon, 2009). Scholars are particularly interested in positive FDI spillovers, which are the benefits of FDI for domestic firms not appropriated by FDI (Javorcik, 2004; Meyer, 2004). In the inter-industry context, positive FDI spillovers can take place in both market and non-market transactions (Meyer, 2004). On the one hand, foreign firms may sell products that can promote innovation and productivity growth in domestic firms. Positive spillovers result when the price of these products is below the maximum price domestic firms are willing to pay (Meyer, 2004; Javorcik, 2008). In other words, positive FDI spillovers from market transactions are equal to the consumer surplus of domestic firms, which is not uncommon as foreign firms are often unable to adopt perfect price discrimination at the time of contracting (Meyer, 2004; Fernandes and Paunov, 2012). On the other hand, positive FDI spillovers can arise from non-market channels when foreign firms enhance domestic firms' performance without being paid (Fu, 2012).

Studies on inter-industry FDI spillovers, however, have largely focused on manufacturing FDI (Javorcik, 2008). Despite the prevalence of services FDI and the importance of services on the performance of user industries (Javorcik, 2008), inter-industry spillovers from services FDI have received limited scholarly attention. The emerging literature on inter-industry spillovers from services FDI (Arnold, Javorcik, and Mattoo, 2011; Fernandes and Paunov, 2012; Mariotti, Nicolini, and Piscitello, 2013; Orlic, Hashi, and Hisarciklilar, 2018) argues there are two main channels through which services FDI can boost domestic firms' performance. First, because of the increased competition from FDI in local service industries, there may be cost reduction and/or increased quality, availability, innovativeness, reliability, and variety of services used by domestic firms (Javorcik, 2008; Orlic, Hashi, and Hisarciklilar, 2018). As a result, domestic firms may experience less production disruption, lower operation costs, and greater efficiency. Second, knowledge embodied in the services provided by FDI may be transferred to domestic firms through a non-contractual relationship. This may occur, for example, through employee turnover, demonstration, and social interaction (Fernandes and Paunov, 2012; Orlic, Hashi, and Hisarciklilar, 2018).

Although this emerging literature has substantially advanced our knowledge, there are two limitations. First, prior studies largely focus on the aggregate level of FDI from multiple service industries so we do not understand whether FDI in a particular service industry can create positive inter-industry spillovers. For example, although Fernandes and Paunov (2012) show that aggregated services FDI contributes to innovation by domestic firms, it is not clear whether and how FDI in industries such as

utilities and real estate that were included in their sample can promote firm innovation in other industries. Second, we know little about the conditions under which positive inter-industry spillovers from services FDI are more likely to take place. Most studies focus only on whether positive spillovers exist. An exception is Mariotti, Nicolini, and Piscitello (2013), who show that domestic firms with low absorptive capacity or greater foreign involvement may benefit less from services FDI. Nevertheless, studies on manufacturing FDI suggest that FDI spillovers tend to be subject to the characteristics of both foreign and domestic firms, the nature of the relationship between foreign and domestic firms, and the institutional environment of the host country (Meyer, 2004; Sinani and Meyer, 2004; Meyer and Sinani, 2009). Additional studies on a more nuanced relationship between services FDI and domestic firms' performance are thus needed.

To address these limitations, this study looks into inter-industry spillovers from foreign banks, specifically how foreign bank penetration influences innovation by non-financial domestic firms in transition economies. This issue is timely and important because although foreign banks increasingly participate in transition economies (Berger, 2007; Poghosyan and Poghosyan, 2010), the debate on whether foreign banks benefit the host country is still ongoing (Dages, Goldberg, and Kinney, 2000).

3. THEORY AND HYPOTHESES

3.1 Credit Channel?

Banks, and foreign banks as well, can provide non-financial firms with funds required for R&D investment and innovation development (Schumpeter, 1934; King and Levine, 1993; Beck, Levine, and Loayza, 2000; Alfaro, Chanda, Kalemli-Ozcan, and Sayek, 2004; Lin, Liu, and Wei, 2018). However, scholars have not reached a consensus on whether foreign bank penetration will improve the overall credit access of domestic firms (Claessens and Van Horen, 2014).

On the one hand, some scholars argue that foreign banks, with their more advanced management practices and technology, can increase competition and improve efficiency in the local banking market, thereby increasing total credit supply and reducing the cost of debt (Gormley, 2010). This is particularly important for countries with underdeveloped equity markets and weak shareholder protection where firms rely largely on bank financing to fund their investments (Giannetti, 2003). In addition, domestic banks in many countries are inclined to lend to established companies owned by well-connected individuals (Laeven, 2001; La Porta, Lopez-De-Silanes, and Zamarripa, 2003). "Unconnected" firms such as new and small firms may be passed over by domestic banks and face severe credit constraints. In contrast, foreign banks may be more willing to fund these firms' promising projects (Agénor, 2003) and help them break down the barriers to entry (Rajan and Zingales, 2003).

On the other hand, other scholars argue that the presence of foreign banks may increase financing costs for domestic firms and hamper domestic firms' overall credit access. First, credit-constrained firms

might be better off in banking markets with less competition (e.g., with less foreign bank penetration), where banks can internalize the benefits of assisting credit-constrained firms by securing a long-term relationship. This is especially the case for innovation investments, which are usually riskier and span a longer time. Second, foreign banks usually suffer from the liability of foreignness and information disadvantages in host countries (Mian, 2006). The higher cost of acquiring information and screening domestic firms might force foreign banks to cream-skim. That is, foreign banks might lend only to the larger and more profitable firms (Dell’Ariccia and Marquez, 2004; Gormley, 2010; Giannetti and Ongena, 2012). Domestic banks would thus be left with a pool of unprofitable and risky firms and be forced to charge higher interest rates (Detragiache, Tressel, and Gupta, 2008). This situation is even worse if foreign banks force some of the domestic banks to exit the market.

The empirical evidence is also mixed (e.g., Clarke, Cull, and Peria, 2006; Detragiache, Tressel, and Gupta, 2008; Giannetti and Ongena, 2009; Gormley, 2010; Lin, 2011; Claessens and Van Horen, 2014). Therefore, it is unclear whether foreign bank penetration can raise domestic firms’ innovation by improving their credit access.

3.2 Non-credit Channels

Foreign banks, however, are distinct from domestic banks in another important aspect; that is, foreign banks offer more diversified banking products. De la Torre, Soledad Martinez Peria, and Schmukler (2008) found that credit is not the main product offered by foreign banks in transition economies. Instead, foreign banks seek to cross-sell lucrative banking services, such as international banking services and global business matchmaking. These services can thus foster domestic firms’ innovation.

For instance, international banking services may motivate domestic firms to engage in international transactions. Domestic firms can acquire new knowledge from these international transactions and combine with their existing knowledge, and result in innovation (Kumaraswamy Mudambi, Saranga, and Tripathy, 2012; Corredoira and McDermott, 2014; Xie and Li, 2018). Besides, multinational banks such as HSBC have started providing global business matchmaking services as these banks are central in a business network that comprises client firms of different sizes, industries, and countries. This service can enhance domestic firms’ awareness and access to potential foreign partners and knowledge.

In addition, what is unique to the banking context is that banks usually have strong incentives to transfer knowledge to their clients to secure the repayment by the firms of the outstanding loan. Field studies provide evidence that bankers actively transfer finance and matchmaking knowledge to their clients (Uzzi and Gillespie, 2002; Uzzi and Lancaster, 2003). As foreign banks often face difficulty in recovering defaults through negotiation due to the liability of foreignness (Mian, 2006), they not only are more capable but also have greater incentives to engage in such knowledge transfer.

To sum up, we argue that while it is unclear whether foreign bank penetration can improve the overall credit access of domestic firms, foreign bank penetration may still promote domestic firms' innovation because of domestic firms' improved access to diversified banking services and knowledge transfer from foreign banks to domestic firms. We hypothesize:

Hypothesis 1: Foreign bank penetration is positively related to domestic firms' innovation.

3.3 Heterogeneity

Javorcik (2008) urged that the debate on FDI spillovers should shift from proving the presence of FDI spillovers to investigating the conditions under which they are more likely to occur. Primarily based on the literature on manufacturing FDI spillovers, scholars suggest that FDI spillovers are conditional on the characteristics of FDI and domestic firms, as well as the institutional environments of the host country (Meyer, 2004; Sinani and Meyer, 2004; Meyer and Sinani, 2009). Accordingly, we identify three conditions under which positive spillovers from foreign banks may vary.

In the first condition, we focus on a characteristic of foreign banks. The banking literature suggests that banks can be broadly categorized into relationship banks and transaction banks based on their major lending strategies. Unlike transaction banks that mostly rely on objective information such as financial statements and collateral to make lending decisions, relationship banks also emphasize soft information such as the borrower's entrepreneurial ability and trustworthiness (De la Torre, Soledad Martinez Peria, and Schmukler, 2008; Beck, Degryse, De Haas, and Van Horen, 2018). Soft information is usually obtained through continuous, personalized, direct contact with clients, clients' employees, and the local community. Research shows that a stronger relationship with clients, and thus a larger amount of soft information, can lead to significantly reduced interest rates and collateral requirements demanded by banks (Berger and Udell 1995).

We posit that positive inter-industry spillovers may be stronger from foreign relationship banks than from transaction banks for two reasons. First, relationship banks have greater incentives to transfer knowledge to their clients (Uzzi and Gillespie, 2002; Uzzi and Lancaster, 2003). This is because helping clients grow (e.g., through innovation) can mitigate the risk of relationship lending that is not hedged by sufficient collateral. Research also shows that banks are more willing to transfer knowledge in a more "embedded" relationship in which trust and reciprocity can be expected (Uzzi and Gillespie, 2002; Uzzi and Lancaster, 2003). Such a relationship is more likely to exist between a relationship bank and its clients because of their frequent and close interactions. Second, compared to foreign transaction banks, foreign relationship banks can transfer knowledge of better fit for their domestic clients through market and/or non-market transactions. Given the frequent interaction and possession of soft information, relationship banks

tend to understand better the strategic needs and capabilities of their clients (Uzzi and Lancaster, 2003). Therefore, foreign relationship banks can better provide customized banking products or introduce suitable foreign partners to their domestic clients. All in all, we predict:

Hypothesis 2: Compared to foreign transaction banks, foreign relationship bank penetration has a stronger positive relation with domestic firms' innovation.

In the second condition, we focus on a characteristic of domestic firms, which is whether they export. As foreign buyers seek low-cost and better-quality products, it is common for them to transfer extensive international knowledge to domestic exporters directly, or indirectly by introducing foreign suppliers (World Bank, 1993; Xie and Li, 2018). Such transfer of international knowledge can reduce the dependence of domestic exporting firms on foreign banks for access to international knowledge. However, domestic non-exporters do not have such alternative international linkages, so they are more dependent on foreign banks for identifying potential foreign partners and engaging in international transactions. Based on the preceding discussion, we expect that non-exporting domestic firms, compared to their exporting counterparts, benefit more from foreign bank spillovers. Formally stated:

Hypothesis 3: The positive relation between foreign bank penetration and innovation is stronger for domestic non-exporters than for exporters.

In the third condition, we focus on a characteristic of the institutional environment of the host country, which is the openness to the global market (Meyer and Sinani, 2009; Xie and Li, 2018). We argue that if a country's institutional arrangements such as FDI and competition laws (Meyer, 2004) encourage free trade and foreign capital flows, the role of foreign banks in providing domestic firms with access to international knowledge is less important. In a more open country, we expect abundant international knowledge to circulate domestically (Meyer and Sinani, 2009; Xie and Li, 2018). This is because many foreign firms arrive with advanced technology and knowledge, and many domestic firms have international knowledge obtained from imports, exports, or outward FDI. Therefore, domestic firms have many opportunities to obtain international knowledge in the local market by, for example, observing and interacting with foreign firms or other domestic firms that have diversified internationally. The need to obtain international knowledge through foreign banks is greatly reduced.

In contrast, when institutions isolate a country from the global market, international knowledge may be scarce in the host country. Relying on foreign banks may thus be particularly important for domestic

firms to acquire international knowledge. We, therefore, posit that inter-industry FDI spillovers from foreign banks are more pronounced in countries that are less open to the global market.

Hypothesis 4: The positive relation between foreign bank penetration and domestic firms' innovation is stronger in countries that are less open to the global market.

4. METHOD

4.1 Sample

To test the hypotheses, we used firm-level data obtained from the fourth and fifth rounds of the Business Environment and Enterprise Performance Survey (BEEPS IV and V), conducted jointly by the European Bank for Reconstruction and Development (EBRD) and the World Bank during 2008–2009 and 2013–2014, respectively. The two organizations devoted much effort to guarantee the high quality of the survey data (Beck, Degryse, De Haas, and Van Horen, 2018; Bircan and De Haas, 2020). Stratified random sampling was utilized to ensure that the survey sample represented the population. Moreover, face-to-face interviews were conducted with the owner or top manager of each firm to ensure that the reported information was accurate. The survey design also took into account potential cross-country differences. All survey questions were piloted before their launch to ensure that the questions were properly translated and understood in each country's institutional contexts.

To focus on domestic firms, we excluded firms with more than 10% foreign ownership.⁴ The final sample covers 18,058 domestic firms in non-financial industries across 27 transitional economies from Eastern Europe and Central Asia.⁵ Regarding national innovation capacity, which is usually measured as international patents such as at the United States Patent and Trademark Office (Furman, Porter, and Stern, 2002; Furman and Hayes, 2004), the sampled countries were third-tier innovator countries at the bottom level (fewer than 30 patents per million persons) according to Furman and Hayes's (2004) categorization in the sample period. Therefore, domestic firms in these countries were likely to be technologically underdeveloped and were urged to catch up. In addition, the banking industry was generally underdeveloped at the beginning of transition in these countries (Giannetti and Ongena, 2009). Although foreign banks could introduce modern banking practices, technology, and capital, different countries adopted different attitudes toward banking FDI. For example, whereas Poland opened up early to foreign

⁴ The 10% cutoff is based on the Organization for Economic Co-operation and Development's definition of FDI. Our results remain qualitatively unchanged when 0% and 50% cutoff points are used.

⁵ The 27 sampled countries are Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, North Macedonia, Moldova, Mongolia, Montenegro, Poland, Romania, Serbia, Slovak Republic, Slovenia, Tajikistan, Turkey, and Ukraine.

banks, the Czech Republic and Slovenia waited until very late. Accordingly, there were significant variations in foreign bank penetration across countries and over time.

4.2 Firm Innovation

Data on domestic firms' innovation were obtained from the Innovation Module of BEEPS. The design of BEEPS allows independent verification of firms' responses regarding their innovation activities based on descriptions of their new products or services. This is important as innovation may mean different things to different people. Another important feature of BEEPS is that it focuses on new-to-the-firm innovation. This is in line with studies examining new-to-the-firm innovation (e.g., Damanpour 1991; Leiponen and Helfat, 2010; Vaccaro, Jansen, Van Den Bosch, and Volberda, 2012), defined as the "adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is new to the adopting organization" (Damanpour, 1991, p. 556). Compared to other definitions that focus on new-to-the-market (e.g., Xie and Li, 2018) or new-to-the-world (e.g., Furman, Porter, and Stern, 2002) innovation, our definition may be more suitable for studying transition economies.

People might associate innovation with groundbreaking innovations that advance the global technological frontier. However, in technologically backward countries, such as our sampled countries, most new products stem from the adoption of existing technologies that have been developed elsewhere, possibly with some customization to better serve the needs of the local market (Furman and Hayes, 2004; Corredoira and McDermott, 2014). Although these innovations do not advance the global technological frontier, they contribute to the catch-up and performance of these firms that have considerable room for improvement on the technological frontier (Bradley, McMullen, Artz, and Simiyu, 2012; Kumaraswamy Mudambi, Saranga, and Tripathy, 2012).

Our dependent variable is *Product Innovation*, which equals 1 if the focal domestic firm introduced any new or significantly improved products or services in the last three years and 0 otherwise. Product innovation could be a new product, a category that includes significant improvements to technical specifications, components and materials, incorporated software, user friendliness, and other functional characteristics of goods and services. We focused on product innovation because its data were available from both BEEPS IV and V.⁶ In addition, product innovation is widely used in the innovation literature (e.g., Damanpour and Gopalakrishnan, 2002; Danneels, 2002; Greve, 2003).

⁶ BEEPS V includes information on more types of innovation, which we used for additional analysis.

4.3 Foreign Bank Penetration

We relied on data on bank branches to measure foreign bank penetration. Specifically, we used the second-round Banking Environment and Performance Survey (BEPS II) conducted jointly by EBRD and Tilburg University. Information on detailed geo-coordinates, as well as opening and closing dates, were collected for 76,154 branches operated by 563 banks across the same 27 countries for which we had firm information. A bank in our sample is a financial institution licensed to receive deposits and make loans. Banks may also provide other financial services such as wealth management, currency exchange, and safe deposit boxes. Because we were interested in how foreign banks foster firm innovation, we focused on commercial banks that provide services for business clients and excluded the 6 retail banks that served only individuals. The majority of the sampled banks served both retail and commercial clients.

Importantly, the BEPS data have information on the foreign ownership of each bank. Specifically, the distinction between a foreign bank and a domestic bank is based on whether more than 50% of a bank's shares were held by foreigners.⁷ This foreign ownership information was further validated with Claessens and Van Horen's (2014) bank ownership database. Because the BEEPS IV (BEEPS V) survey was undertaken during 2008–2009 (2013–2014) and the innovation module captured the innovation activities during the past three years, we relied on the BEPS data in 2005 (2010) to measure foreign bank penetration so that there is a sufficient time lag between the independent variable and the dependent variable.

We then matched each firm with nearby bank branches in the same city (Beck, Degryse, De Haas, and Van Horen, 2018; Qi and Ongena, 2019; Qi and Ongena, 2020). The underlying assumption is that social interactions between firms and banks are geographically constrained and a firm can only ensure access to the services of bank branches that are geographically close. Despite technological progress, banking remains a local affair as banks tend to service nearby enterprises to keep transportation and agency costs in check. This has been confirmed by Petersen and Rajan (2002), Guiso, Sapienza, and Zingales (2004), and Degryse and Ongena (2005). Local variation in the banking markets can therefore explain why firms in certain areas are more constrained in obtaining banking services than similar firms elsewhere (Bircan and De Haas, 2020). Consistently, spatial proximity has been considered an important condition for FDI spillovers (e.g., Wang and Wu, 2016; Xu, 2011). After matching, we constructed our main independent variable, *Share of Foreign Banks w/i City*, to capture the share of foreign bank branches in the

⁷ The 50% cutoff that reflects common majority voting rules has been used by most studies in the banking literature (e.g., Clarke, Cull, and Peria, 2006; Detragiache, Tressel, and Gupta, 2008; Giannetti and Ongena, 2009; Poghosyan and Poghosyan, 2010).

total number of bank branches in the same city.⁸ A higher value means that a firm was surrounded by a greater number of foreign versus domestic bank branches.⁹

We also matched the sampled domestic firms with nearby bank branches by circles to ensure the robustness of our analyses. Specifically, instead of focusing on the city level, we drew a 10-kilometer (km) circle around the geo-coordinates of each firm and linked the firm to bank branches inside that circle. This procedure produced the *Share of Foreign Banks w/i 10km* variable. We did this to address the possibility that firms may connect with bank branches in another city that are geographically closer. Also, when we matched firms and nearby bank branches by circles, we found variations in the share of foreign banks even for firms located in the same city. Thus, we could control for city fixed effects. City fixed effects reduce potential concerns about different city government policies or institutions that affect the clustering of foreign banks and domestic firms' innovations.

4.4 Moderators

To test hypothesis 2, we followed Beck, Degryse, De Haas, and Van Horen (2018) to identify whether a foreign bank is a relationship lender based on BEPS II question Q6, which asked bank insiders to rate on a five-point scale the importance (frequency of use) of the following techniques when dealing with SMEs: relationship lending, fundamental and cash flow analysis, business collateral, and personal collateral (personal assets pledged by the entrepreneur). Although almost all banks found that building a relationship was of some importance to their lending, only some of the banks found building a relationship was “very important” and the rest considered it only “important” or “neither important nor unimportant.” We categorized the banks that considered relationships “very important” as relationship banks and the rest as transaction banks. Then, we constructed the share of foreign banks that were relationship or transaction lenders around the focal firm.¹⁰

We used sub-sample analysis to test hypotheses 3 and 4. For hypothesis 3, we divided domestic firms into exporters and non-exporters based on BEEPS data. For hypothesis 4, we divided the sampled

⁸ We did not use the share of foreign banks in terms of revenue because such information is not available at the bank branch level. The share of foreign bank branch numbers is the best available option to capture foreign bank penetration at the local level. Many banking studies use similar measures (e.g., Gormley, 2010; Jeon, Olivero, and Wu, 2011; Lensink and Hermes, 2004; Wu, Chen, Jeon, and Wang, 2017).

⁹ As we control the *Number of Bank Branches* in all regressions, the *Share of Foreign Banks* captures the penetration of foreign banks conditional on the size of the local banking markets. In this sense, whether we use the share or number of foreign bank branches as our variable of interest makes no major difference from an econometric perspective. This is validated by a robustness check in column 4 of Table III, where the *Share of Foreign Banks* is replaced by the *Number of Foreign Banks*.

¹⁰ Given that the data of whether the focal domestic firm has interacted with foreign relationship banks are not available, we assumed that if domestic firms are surrounded by a greater share of foreign banks that rely on relationship lending, they are, on average, more likely to interact with these banks and benefit from their knowledge transfer. This assumption is likely to hold in our sample as BEEPS used stratified random sampling that can reflect the population. Beck, Degryse, De Haas, and Van Horen (2018) have also used the same databases (BEEPS and BEPS) and suggested that firms surrounded by a larger share of banks using relationship lending, on average, are more likely to be influenced by relationship lending.

countries into more or less open economies based on the KOF economic globalization index constructed by ETH Zurich. This index measures the degree of economic globalization from two dimensions and combines them into a single index (Dreher, 2006). The first dimension is actual flows: trade, FDI, and portfolio investment (all in percentage of GDP). Income payments to foreign nationals and capital employed (in percentage of GDP) are included to proxy for the extent to which a country employs foreign people and capital in its production processes. The second dimension measures restrictions on trade and capital using hidden import barriers, mean tariff rates, taxes on international trade (as a share of current revenue), and an index of capital controls. A country with a higher KOF economic globalization index is considered more open to the global market. As most of our sampled countries are in Europe, we classified countries as more/less open if the KOF economic globalization index of a certain country was above/below the European KOF economic globalization index.¹¹

4.5 Control Variables

A common set of control variables was included in the analysis to reduce concerns of alternative explanations. *Export* measures the percentage of sales from exports by the focal domestic firm. *Firm Age* is the log number of years since the establishment of the focal firm. *Number of Employee* is the log number of permanent employees of a firm. *Audited Firm* is a binary variable that equals 1 if a firm's annual financial statements were certified by an external auditor and 0 otherwise. *Female Managed Firm* is a binary variable that equals 1 if the top manager of the firm was female and 0 otherwise. Firm ownership was also controlled, using three dummy variables indicating whether a firm was a *Sole Proprietorship Firm*, *Publicly Listed Firm*, or *State Owned Firm*. The holding structure of a firm was considered (*Holding Company*) and we further controlled for whether a firm received any subsidies from national, regional, or local governments or European Union in the last three years (*Subsidy*). More importantly, we controlled for the domestic firms' absorptive capacity in terms of innovation by including *R&D Investment* to capture the binary status of whether a firm carried out any research and development (R&D) activities in the past. In technologically backward countries, often only large and innovative firms engage in internal R&D (Kumaraswamy Mudambi, Saranga, and Tripathy, 2012). Finally, in addition to the share of foreign banks, we included the *Number of Bank Branches*, which represents the total number of bank branches, and the *HHI of Banks*, which was measured using a Herfindahl–Hirschman index within the city or the circle where the focal firm was located to control for the impact of banking market size and competition on firm innovation.

A summary of all variables' measurement and data sources is provided in Table A1 of the Appendix. Table I provides summary statistics. Only 34% of our firms engaged in product innovation. About 35% of

¹¹ Our results remain unaffected if we used the mean value of the sampled countries' KOF index to divide the full sample.

bank branches, on average, are foreign-owned in a city. Banking market competition is moderate, with an HHI of 0.16.¹² On average, these domestic firms export about 10% of their products abroad. Most of the sample firms are SMEs, with only about 6% publicly listed on a stock exchange.

[Insert Table I about here]

4.6 Model

To test hypothesis 1, we used Model (1) as the baseline model:

$$Product\ Innovation_{ilcst} = \alpha_{ct} + \alpha_{st} + \beta * Share\ of\ Foreign\ Banks\ w/i\ City_{l,t-3} + \gamma X_{ilcst} + \varepsilon_{ilcst} \quad (1)$$

for firm i operating in city l of country c in industry s in year t . In total, we have 18,058 firms operating across 27 countries over 2 waves of the survey. X represents the set of control variables. Country*year and sector*year fixed effects were included at the country-year and sector-year levels to control for all time-varying factors at the country and industry levels. Standard errors were clustered at the firm level, but our results are robust when we clustered at the city level. All regressions were estimated using logit.

We also estimated a specification where firms and bank branches were matched using a circle with a radius of 10 km around the geo-coordinates of each firm. This is shown in Model (2):

$$Product\ Innovation_{ilcst} = \alpha_{lt} + \alpha_{st} + \beta * Share\ of\ Foreign\ Banks\ w/i\ 10\ km_{it} + \gamma X_{ilcst} + \varepsilon_{ilcst} \quad (2)$$

for firm i operating in city l of country c in industry s in year t . Instead of country*year fixed effects, we included city*year fixed effects in this specification, which controls for all time-varying factors at the city (including country) and industry levels. The same set of control variables was included and standard errors were clustered at the firm level. Similarly, logit estimates were used.

For hypothesis 2, we measured not only the *Share of Foreign Banks*, but also the *Share of Foreign Relationship Banks* and *Share of Foreign Transaction Banks* to examine whether the positive relation between foreign bank penetration and firm innovation is more pronounced when the surrounding foreign banks rely more on relationship lending. To support hypotheses 3 and 4, we expect to find a more positive

¹² Based on the US Department of Justice, a market with an HHI of less than 0.1 is considered “well diversified,” between 0.1 and 0.18 is “moderately concentrated,” and 0.18 or greater is “highly concentrated.”

relation between the share of foreign banks and firm innovation in the sub-samples of domestic non-exporters and countries below the European KOF economic globalization index.

5. RESULTS

5.1 Baseline

Our baseline empirical results are presented in Table II. Because the offering of banking services still relies largely on proximity, we start with columns 1–3 at the city-level. The banking market characteristics are captured in the same city of the focal firm. Specifically, we applied Model (1). In column 1, we excluded firm-level control variables and fixed effects, and in column 2 we added the set of control variables. In column 3, we controlled for sector*year fixed effects and country*year fixed effects.

The coefficient of *Share of Foreign Banks w/i City* is positive and significant with a p -value of 0.000. Economically, if the share of foreign banks increases by 30% (approximately one standard deviation), a domestic firm is approximately 21% more likely to engage in product innovation, which is economically sizable.¹³ The findings thus support hypothesis 1. To determine the aggregate effect, consider the following back-of-the-envelope calculation. In 2015, according to the European Commission’s “Enterprise and Industry SBA Factsheet 2016: Poland,” there were 1.54 million SMEs in Poland.¹⁴ If the share of foreign banks in Poland increases by 30%, there would be about 21% more firms engaging in innovation, that is, 323,400 firms in absolute value. This is only a conservative calculation that ignores the fact that with a greater foreign bank penetration, the number of entrepreneurs may also increase.

In columns 4–6 of Table II, we followed Model (2) to examine *Share of Foreign Banks w/i 10 km*. This model can address the endogeneity concerns in Model (1), in which our results may be driven by city-level omitted variables that simultaneously influence foreign bank penetration and domestic firms’ innovation. The estimates show statistically similar results, but economically the impact of foreign bank penetration is even larger. For example, in column 6 of Table II, if the share of foreign banks increases by 30% (approximately one standard deviation), a firm is approximately 29% more likely to engage in innovation.¹⁵ For the same back-of-the-envelope calculation, if the share of foreign banks in Poland increases by 30%, approximately 446,600 more firms would carry out product innovations.

Last, in column 7 of Table II, in addition to the 10-km radius circle, we included the banking market characteristics within 15- and 20-km radius circles. This analysis is meant to validate our expectation that

¹³ In Table A2 of the Appendix, we include both the share of foreign banks and its lagged variable to control for the serial correlation, and our results are unaffected.

¹⁴ According to the European Commission’s “Enterprise and Industry SBA Factsheet 2016: Poland,” in 2015, SMEs accounted for 99.8% of businesses in the Polish “non-financial business economy.”

¹⁵ In Table A3 of the Appendix, we further decompose product innovation in BEEPS IV and V separately and the results are significantly positive in both of them. This indicates that our results are not driven by a specific wave of the survey but are consistent over time. In BEEPS V, there is information about three other types of innovation: process, organizational, and marketing innovations. But we find no significant effect from foreign bank penetration on them.

close proximity of banks is important for domestic firms' innovation. As expected, the result shows that the positive relation between foreign bank presence and firm innovation is valid only within a 10-km radius and diminishes under a larger geographical scope. Based on all of the preceding results, we find that inter-industry spillovers from foreign banks are likely to occur at a relatively local level.

[Insert Table II about here]

5.2 Endogeneity

In this part, we try to come closer to a causal interpretation by addressing potential concerns of omitted variables and reverse causality. The first source of omitted variables may come from the presence of non-financial FDI. In cities where there are more foreign banks, there might also be more non-financial FDI that produces other types of FDI spillovers. Therefore, we attempt to control for the share of foreign firms (in numbers) around each domestic firm in our sample. Because BEEPS data do not provide a complete picture of the presence of non-financial foreign firms, we used the BvD Amadeus database, which contains information on more than 21 million public and private firms across 34 European countries. We then matched this complete firm information with our BEEPS data, resulting in a sample of 7,738 domestic firms with precise surrounding foreign firm information. We included the *Share of Foreign Firms* and the *Number of Firms* as controls in our regression and the result is reported in column 1 of Table III. The estimates show that the coefficient of the *Share of Foreign Bank w/i 10 km* still has a p -value of 0.000, indicating that concerns related to omitted variable bias due to the presence of non-financial FDI are negligible.

[Insert Table III about here]

The second source of omitted variable bias may be the availability of other knowledge-intensive business services (KIBS) which may also contribute to domestic firms' innovation. The presence of KIBS, likely in large cities of a country, may correlate with the presence of foreign banks, thus confounding our results. To alleviate this concern, we conducted a robustness test in which we focused our analysis on smaller cities where KIBS are unlikely to be present. Specifically, we retained only cities with a population of fewer than 50,000 residents. We further excluded the capital city of a country. The result is presented in column 2 of Table III, which is consistent with our result in the main analysis both statistically and economically.

The third source of omitted variable bias may come from unobserved firm-level characteristics that influence domestic firms' innovation. To tackle this issue, we repeated the baseline analysis using a sample of 834 domestic firms that were included in both waves of BEEPS and experienced a change in their

innovation activities. In this smaller panel, we were able to control for firm level fixed effects to address unobserved firm-level differences. The result is provided in column 3 of Table III, where our main finding is unchanged.

To further check the presence of omitted variable bias, we applied a methodology developed by Oster (2019). The test computes the share of variation that the omitted variables need to explain (relative to the variation explained by the control variables and fixed effects already included in the estimations) to reduce the effect to 0. This share is denoted as δ . For instance, $\delta = 2$ indicates that the omitted variables need to be twice as important as observables to explain away the entire effect of the share of foreign banks on firm innovation and reduce the coefficient of interest to 0. Following Oster (2019), δ is measured as $\frac{\beta_{Full}}{\beta_{Restrict} - \beta_{Full}} * \frac{R_{Full} - R_{Restrict}}{R_{Max} - R_{Full}}$, where $\beta_{Restrict}$ is the coefficient on *Share of Foreign Banks* from the restricted model with no control variables and fixed effects (column 4 of Table II), and β_{Full} is the coefficient from the full model using a full set of controls and fixed effects (column 6 of Table II). $R_{Restrict}$ and R_{Full} are the relevant R^2 from the restricted and full models, respectively. Oster's (2019) test requires specifying the value of R_{max} , which is the R^2 from a hypothetical regression that includes both observed and unobserved controls. Based on experimental evidence, Oster (2019) recommends setting $R_{max} = 1.3R_{Full}$. An alternative approach to assess the robustness of the results is to estimate a set of possible ranges for the coefficient, which is $[\beta^*, \beta_{Full}]$, where the bias-adjusted treatment effect is $\beta^* = \beta_{Full} - (\beta_{Restrict} - \beta_{Full}) * \frac{R_{Max} - R_{Full}}{R_{Full} - R_{Restrict}}$. If the range does not include 0, the estimates are considered robust.

After calculation for our data, $\delta = 2.866$, which is significantly higher than the benchmark of 1 recommended by Oster (2019). The interpretation is that the omitted variables need to be almost three times as important as the observables to completely reduce the coefficient of interest to 0. This is highly unlikely given that our regression specifications already include a large set of firm characteristics and fixed effects. In addition, the estimated possible range for β is between 0.630 and 0.967, giving us further confidence that unobservable omitted variables do not drive our results. Given that Altonji, Elder, and Taber (2005) argue that there is good reason to suspect that the relation between observables and the outcome is stronger than the outcome's relation with unobservables, our result is unlikely to be driven by omitted variables.

We next address reverse causality, that is, whether our results are driven by the possibility that innovative domestic firms attract more foreign banks around them. Theoretically, whether this possibility holds remains a matter of debate. Some scholars argue that banks may be reluctant to fund innovation activities by SMEs (Stiglitz, 1985; Carpenter and Petersen, 2002; Brown, Martinsson, and Petersen, 2012) as innovations are likely to be associated with investment in mostly intangible assets that are difficult to be collateralized (Carpenter and Petersen, 2002). Nevertheless, we checked this possibility empirically.

One potential source of reverse causality is that good firms with better past performance are more likely to be more innovative and attract foreign banks to locate around them (Detragiache, Tressel, and Gupta, 2008). In additional analyses, we used firms' realized sales growth in the past three years ($t-3$ to $t-1$) as the independent variable (*Past Performance*) to investigate its impact on the subsequent share of foreign banks in the survey years (t). The results are reported in column 5 of Table III. The impact of firms' past performance on subsequent foreign bank penetration is close to 0, both statistically and economically, implying that a greater concentration of high-growth firms does not lead to greater foreign bank penetration.

To further deal with reverse causality, we used an instrumental variable approach. Specifically, we instrumented the share of foreign banks by the existence of a *Credit Registry* in a country. A credit registry is a credit reporting institution. It collects information from a wide variety of financial and nonfinancial entities, including microfinance institutions and credit card companies, and provides comprehensive consumer credit information with value-added services such as credit scores for private lenders. There are two main types of credit reporting institutions. Private credit bureaus are privately owned and operated companies, and public credit registries are public entities managed by bank supervisors or central banks.

Intuitively, credit registries could foster the sharing of borrower information and reduce the information asymmetry between borrowers and lenders (Jappelli and Pagano, 2002). They would thus significantly affect the structure of the local banking market. Theoretically, domestic banks are better at exploiting information provided by a credit registry in their own country because they are better at interpreting the contents of such information. In this regard, the existence of a credit registry would benefit domestic banks more than foreign banks and induce a lower share of foreign banks.

Regarding the exclusion conditions, credit information sharing systems are unlikely to *directly* affect firms' innovation practices. The main aim of a credit reporting system is to create a sound financial infrastructure that both facilitates lending and stabilizes financial markets. Credit reporting systems are never focused on directly promoting the innovation activities of non-financial firms. More importantly, both our theoretical predictions and empirical findings (as shown in Table VI in the next section) suggest that the innovation promoting effect of foreign banks is through the non-credit channels. In other words, foreign banks foster domestic firms' engagement in innovation activities not by improving the overall credit access of domestic firms. Therefore, the existence of credit information sharing systems in a country is unlikely to indirectly affect non-financial firms' innovation via lending facilitation. Lastly, many of the credit reporting systems in emerging countries were developed by external initiatives such as the Global Credit Reporting Program established by the International Finance Corporation (IFC).¹⁶ These programs

¹⁶ According to the IFC, since 2001, it has provided support for the development of credit reporting systems in more than 60 emerging countries worldwide and has directly supported the setup or significant improvement of credit reporting systems in 20 countries including Bosnia and Herzegovina, Bulgaria, and Romania. Similar initiatives also occurred in the Middle East and North Africa covered by the Arab Credit Reporting Initiative, and in Latin America and the Caribbean covered by the Western Hemisphere

make the existence of credit registries more exogenous in our setting. One drawback of using this instrument is that in the regression setting, city*year fixed effects must be excluded because variation in the instruments is at the country*year level (but we could still control for city fixed effects).

The introduction years of credit registries (either private credit bureau or public credit registry) for our 27 countries are listed in Table A4 of the Appendix. The instrumental variable regression results are presented in Table IV. From the first-stage regression, the introduction of credit registries significantly reduces the share of foreign banks. In other words, credit registries benefit domestic banks more than their foreign competitors, which is in line with our theoretical prediction. Economically, with the introduction of a credit registry, the share of foreign banks decreases by 6%. The second-stage results show that with the instrument in place, we still find that the share of foreign banks has a significant impact on firm innovation. Economically, the impact is much stronger. The results indicate that what we find in our baseline regressions is a lower boundary of the real effect, and reverse causality is unlikely to bias our findings.

[Insert Table IV about here]

5.3 Mechanisms

Although scholars have not reached consensus about whether foreign bank penetration improves domestic firms' overall credit access, we explicitly checked this for our results. In column 1 of Table VI, we investigate whether a larger share of foreign banks around a firm leads to a smaller *Financing Obstacle*. Following Qi and Ongena (2019), we applied BEEPS question K30, which asked about the degree to which access to finance, which includes availability and costs such as interest rates, fees, and collateral requirements, was an obstacle. Firms' responses were coded on a scale from 1 to 4, where higher values correspond to greater financing obstacles. This measure captures firms' perceptions, but as empirically confirmed by Hainz and Nabokin (2013), this perception-based measure is "surprisingly precise".

We also used an alternative, more practical measure of firms' credit access. Specifically, we followed Beck, Degryse, De Haas, and Van Horen (2018) and Qi and Ongena (2020) and created the variable *Credit Constraint*. We combined three questions in BEEPS to first distinguish between firms with and without demand for credit. Among the former group, we then identified firms that were credit constrained: those that either got rejected in a loan application or were discouraged from applying for a loan in the first place. We started with BEEPS question K16: "Did the establishment apply for any loans or lines of credit in the last fiscal year?" For firms that answered "No," we moved to question K17, which asked the main reason the establishment did not apply for any line of credit or loan. For firms that answered

“Yes,” question K18a subsequently asked: “In the last fiscal year, did this establishment apply for any new loans or new credit lines that were rejected?” We classified firms as credit unconstrained if they answered both “Yes” to K16 and “No” to K18a, and firms as credit constrained if they answered “Yes” to K18a or provided one of the following answers to K17: “Interest rates are not favorable,” “Collateral requirements are too high,” “Size of loan and maturity are insufficient,” or “Did not think it would be approved.”

The estimates are presented in columns 1 and 2 of Table V. We find that the penetration of foreign banks does not improve domestic firms’ credit access in addition to those previously provided by domestic banks. In other words, the entry of foreign banks does not significantly enhance the efficiency of the local banking markets and does not increase the overall supply of credit or decrease the overall financial costs. Foreign banks act mostly as a substitute for domestic banks in providing credit. It does not mean foreign banks provide no credit to domestic firms. What these findings do indicate is that foreign banks are not acting superior to their domestic competitors.

Next, we seek evidence for our theorized channels of spillovers from foreign banks. In BEEPS V, *Foreign Technology* measures whether the focal firm used any technology licensed from a foreign-owned company (excluding office software).¹⁷ The result in column 3 of Table V suggests that the share of foreign banks is positively related to the adoption of foreign technology. This result is consistent with our theoretical predictions that foreign bank penetration may improve domestic firms’ access to international knowledge, for example, by increasing the availability of international banking services in the local market.

[Insert Table V about here]

5.4 Heterogeneity

After establishing fairly robust results for the main effects of foreign bank penetration on domestic firms’ innovation, we examine the conditions under which the effects may vary. Hypothesis 2 is tested with the results in Table VI. In column 1, in addition to the *Share of Foreign Banks w/i 10 km*, we added the *Share of Foreign Relationship Banks w/i 10 km* to test whether the correlation is stronger when nearby foreign banks rely more on relationship lending. Alternatively, in column 2, we checked whether both foreign banks using relationship and transaction lending lead to positive spillovers by simultaneously including the *Share of Foreign Relationship Banks w/i 10 km* and the *Share of Foreign Transaction Banks w/i 10 km*. Taken together, the results support hypothesis 2 and indicate that the relation with foreign relationship bank penetration is more than double the relation with foreign transaction banks. Specifically, when the share of

¹⁷ Unfortunately, the measure of Foreign Technology is available only in BEEPS V but not in BEEPS IV.

foreign relationship (transaction) banks increases by 30%, the probability of domestic firms launching product innovation increases by 44% (18%).

[Insert Table VI about here]

For hypothesis 3, we distinguished between non-exporting and exporting domestic firms in columns 1 and 2 of Table VII, respectively. The coefficient of the share of foreign banks is positive and significant only for non-exporting firms ($p = 0.000$), which supports hypothesis 3. Economically, the relationship is stronger for non-exporting firms than what we find in Table II based on the full sample. When the share of foreign banks increases by 30%, domestic non-exporting firms are 43% more likely to engage in product innovation.

For hypothesis 4, we divided the full sample into two sub-samples based on the economic openness of each country. Specifically, we classify countries as less/more open (in columns 3 and 4 of Table VII, respectively) if their KOF economic globalization index is below/above the European index. We find that the share of foreign banks has a positive and significant relation for domestic firms located in less open countries ($p = 0.000$). The magnitude is economically sizable: with a 30% increase in the share of foreign banks, the likelihood that domestic firms will engage in innovation increases by 42% in less open economies. The positive relation between foreign banks and firm innovation, however, disappears in more open countries. Overall, hypothesis 4 is supported.

[Insert Table VII about here]

5.5 Policy Implication

Until now, we have shown a positive spillover of foreign bank penetration on domestic non-financial firms' innovation activities. Then a natural following-up question is where the spillover comes from in the supply chain. To answer this question, we follow Porter (1974), Andersson (2006), and Shan, Gan, and Zheng (2008) to classify firms into upstream or downstream based on their industry classifications, i.e. how close a certain industry is to the consumers. After classification, we find that out of the 18,058 firms, 10,367 of them are in the downstream industries (food, tobacco, retail, transport, communication, hotels, restaurants, and IT) while the other 7,691 firms come from upstream sectors (textile, wood, papers, chemicals, mining, machinery, equipment, and construction).

We also do a subsample analysis to formally test if the spillover happens in upstream or downstream industries. The results are shown in Table VIII. We find that the positive spillover of foreign banks comes from both upstream and downstream industries, but the economic impact is larger among downstream firms. Therefore, foreign bank presence benefits both upstream and downstream firms. No matter in what position

a country's industrial structure is, whether it is in the upstream or downstream of the global supply chain, an emerging country could benefit from foreign banks. Having said that, a country that is positioned more in the downstream of the supply chain would benefit more because of foreign banks.

[Insert Table VIII about here]

Last, we examine the real effects of foreign bank penetration using firms' employment and R&D investment. The results are listed in Table IX. Specifically, we find that the presence of foreign banks can significantly promote firms' employment. However, we find no significant results concerning firms' R&D investment. A potential reason is that the innovation activities in these transition countries are mostly imitations that are only new-to-the-firm. Compared to the new-to-the-world innovations, these imitations usually don't need large scale in-house R&D investment. But such innovations can significantly help firms in the transition countries to be more competitive, and as a result, generate larger employment needs.

[Insert Table IX about here]

6. CONCLUSION

Our study shows that foreign bank penetration is positively related to domestic firms' innovation in transition economies. This positive relation is stronger with foreign relationship banks, domestic non-exporting firms, and host countries that are less open to the global market. Our study is thus important for managers and policy makers. First, foreign firms often seek to negotiate with host-country governments for favorable policies and support (Meyer, 2004). At the same time, domestic competitors may lobby governments to protect their interests, often at the expense of foreign firms. The bargaining power of foreign firms, however, generally decreases after their entry and resource commitments, thereby presenting a high risk of opportunistic expropriation by governments. This is particularly true in transition economies whose institutional development is weak. It is therefore important for foreign firms to maintain their bargaining power by proving their value to the welfare of the host country. Thus, our findings can be useful for foreign banks negotiating with host-country governments.

Second, our study can help domestic entrepreneurs and managers, especially those who seek to upgrade their firms' innovation capacity, to decide on locational strategies. We report the advantages of locating a firm in a local market with a higher share of foreign banks, especially those using relationship lending. For example, the firm can gain better access to international banking services, which can help acquire advanced international knowledge. Our study is particularly insightful for entrepreneurs and managers of firms that do not export or are in a less open country. These firms have fewer international

linkages so that foreign banks may be particularly important for granting them access to international knowledge.

Last, our study can help policy makers design policies for the banking industry. Overall, our study suggests that it is beneficial for a country to be open to banking FDI. Doing so can promote domestic firms' innovation, although it does not make any difference in domestic firms' overall access to bank credit. The gain from attracting banking FDI is higher for countries that have many non-exporting firms and countries that are isolated from the global market. This suggests that transition economies in the early transition phase are likely to gain from banking FDI. In addition to the general attitude toward banking FDI, our study can help policy makers design specific policies. For example, policy makers can attract foreign relationship banks in the pre-entry stage or encourage foreign banks to use relationship lending to a greater extent in the post-entry stage. Finally, policy makers can provide incentives for foreign banks to locate their branches in areas with a low share of foreign banks and with many technologically backward domestic firms.

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Table I Summary statistics

Variable	Obs.	Mean	Std.	Min.	Max.
<i>Firm Innovation</i>					
Product Innovation	18,058	0.341	0.474	0	1
Process Innovation	9,571	0.177	0.382	0	1
Organizational Innovation	9,571	0.192	0.394	0	1
Marketing Innovation	9,571	0.215	0.410	0	1
<i>Banking Market</i>					
Share of Foreign Banks w/i City	18,058	0.367	0.329	0.000	1.000
Number of Bank Branches w/i City	18,058	0.119	0.274	0.000	1.950
HHI of Banks w/i City	18,058	0.162	0.200	0.000	1.000
Share of Foreign Banks w/i 10 km	18,058	0.440	0.309	0.000	1.000
Number of Bank Branches w/i 10 km	18,058	0.109	0.186	0.000	1.527
HHI of Banks w/i 10 km	18,058	0.200	0.205	0.000	1.000
<i>Firm Characteristics</i>					
R&D Investment	18,058	0.161	0.367	0	1
Export	18,058	10.572	25.119	0	100
Firm Age	18,058	0.156	0.132	0.000	1.830
Number of Employees	18,058	0.630	1.372	0.020	13.500
Audited Firm	18,058	0.408	0.491	0	1
Female Managed Firm	18,058	0.201	0.401	0	1
Sole Proprietorship Firm	18,058	0.132	0.339	0	1
Publicly Listed Firm	18,058	0.058	0.233	0	1
State Owned Firm	18,058	0.022	0.145	0	1
Holding Company	18,058	0.081	0.273	0	1
Subsidy	18,058	0.094	0.291	0	1
Finance Obstacle	18,058	1.277	1.319	0	4
Credit Constraint	10,125	0.342	0.474	0	1
Foreign Techonology	9,571	0.204	0.403	0	1
Past Performance	11,848	0.022	0.106	-0.009	1.268
<i>Locality Characteristics</i>					
Share of Foreign Firms	7,738	0.149	0.180	0.000	0.818
Number of Firms	7,738	4.818	2.273	0.693	9.827
KOF Economic Globalization Index	18,058	64.788	9.658	46.390	85.568
Credit Registry	18,058	0.857	0.350	0	1

Table II Relation between foreign bank penetration and firm innovation: Baseline

Dependent variable	Product Innovation						
	1	2	3	4	5	6	7
Share of Foreign Banks w/i City	1.105*** (0.000)	1.049*** (0.000)	0.704*** (0.000)				
Number of Bank Branches w/i City	0.016 (0.796)	-0.058 (0.389)	0.038 (0.614)				
HHI of Banks w/i City	0.575*** (0.000)	0.638*** (0.000)	0.180* (0.094)				
Share of Foreign Banks w/i 10 km				1.195*** (0.000)	1.145*** (0.000)	0.967*** (0.000)	0.859*** (0.000)
Number of Bank Branches w/i 10 km				-0.860*** (0.000)	-0.855*** (0.000)	-0.316* (0.089)	-0.365 (0.372)
HHI of Banks w/i 10 km				0.389*** (0.000)	0.448*** (0.000)	0.189 (0.120)	0.117 (0.571)
Share of Foreign Banks w/i 15 km							-0.022 (0.951)
Number of Bank Branches w/i 15 km							1.705** (0.024)
HHI of Banks w/i 15 km							0.243 (0.430)
Share of Foreign Banks w/i 20 km							0.228 (0.481)
Number of Bank Branches w/i 20 km							-1.620*** (0.004)
HHI of Banks w/i 20 km							-0.160 (0.572)

R&D Investment	1.669***	1.456***	1.682***	1.441***	1.441***		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Export	0.005***	0.004***	0.004***	0.004***	0.004***		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Firm Age	0.150	0.136	0.113	0.154	0.154		
	(0.269)	(0.365)	(0.409)	(0.317)	(0.315)		
Number of Employee	0.061***	0.047***	0.070***	0.049***	0.049***		
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)		
Audited Firm	-0.556***	-0.599***	-0.570***	-0.606***	-0.606***		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Female Managed Firm	0.182***	0.146***	0.190***	0.144***	0.143***		
	(0.000)	(0.002)	(0.000)	(0.002)	(0.002)		
Sole Proprietorship Firm	0.179***	-0.081	0.143***	-0.075	-0.076		
	(0.000)	(0.158)	(0.004)	(0.195)	(0.191)		
Publicly Listed Firm	0.107	-0.188**	0.149*	-0.161*	-0.163*		
	(0.166)	(0.028)	(0.055)	(0.068)	(0.065)		
State Owned Firm	0.121	-0.066	0.129	-0.013	-0.012		
	(0.312)	(0.605)	(0.280)	(0.921)	(0.928)		
Holding Company	-0.012	0.089	0.006	0.102	0.103		
	(0.853)	(0.197)	(0.925)	(0.152)	(0.148)		
Subsidy	0.559***	0.500***	0.504***	0.521***	0.518***		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Sector * Year Fixed Effects	No	No	Yes	No	No	Yes	Yes
Country * Year Fixed Effects	No	No	Yes	No	No	No	No
City * Year Fixed Effects	No	No	No	No	No	Yes	Yes
<i>Pseudo R-Squared</i>	0.026	0.109	0.196	0.026	0.108	0.214	0.215
<i>Observations</i>	18,058	18,058	18,058	18,058	18,058	18,058	18,058

Logit regressions are utilized where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table III Relation between foreign bank penetration and firm innovation: Robustness

Dependent variable	Product Innovation				Share of Foreign Banks w/i 10 km
	1	2	3	4	5
Share of Foreign Banks w/i 10 km	1.120*** (0.000)	0.998*** (0.000)	1.407*** (0.003)		
Number of Bank Branches w/i 10 km	0.195 (0.581)	0.422 (0.706)	-0.663 (0.339)	-1.056*** (0.000)	0.247*** (0.000)
HHI of Banks w/i 10 km	0.146 (0.579)	0.210 (0.164)	1.250** (0.032)	0.444*** (0.001)	-0.058** (0.011)
Share of Foreign Firms	-0.224 (0.373)				
Number of Firms	0.001 (0.977)				
Number of Foreign Banks w/i 10 km				0.143*** (0.000)	
Past Performance					0.009 (0.443)
Controls	Yes	Yes	Yes	Yes	Yes
Sector * Year Fixed Effects	Yes	Yes	No	Yes	Yes
City * Year Fixed Effects	Yes	Yes	No	Yes	Yes
Firm Fixed Effects	No	No	Yes	No	No
Year Fixed Effects	No	No	Yes	No	No
<i>Pseudo R-Squared</i>	0.208	0.261	0.387	0.213	0.788
<i>Observations</i>	7,738	5,688	1,668	18,058	11,848

Logit regressions are utilized in columns 1-4 and OLS regression is applied in column 5 where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table IV Relation between foreign bank penetration and firm innovation: IV

Dependent variable	<i>First-stage</i>	<i>Second-stage</i>
	Share of Foreign Banks w/i 10 km	Product Innovation
Credit Registry	-0.060*** (0.000)	
Share of Foreign Banks w/i 10 km		4.121*** (0.000)
Number of Bank Branches w/i 10 km	0.248*** (0.000)	-1.069*** (0.000)
HHI of Banks w/i 10 km	-0.035** (0.045)	0.171** (0.034)
Controls	Yes	Yes
Sector * Year Fixed Effects	Yes	Yes
City Fixed Effects	Yes	Yes
<i>Adjusted R-Squared</i>	0.771	n.a.
<i>Observations</i>	18,058	18,058

OLS regression is utilized in the first-stage and logit regression is applied in the second-stage where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table V Relation between foreign bank penetration and firm innovation: Mechanisms

Dependent variable	Finance	Credit	Foreign
	Obstacle	Constraint	Technology
	1	2	3
Share of Foreign Banks w/i 10 km	-0.050 (0.334)	-0.076 (0.640)	1.347*** (0.000)
Number of Bank Branches w/i 10 km	0.055 (0.487)	-0.051 (0.799)	0.235 (0.202)
HHI of Banks w/i 10 km	0.150*** (0.001)	0.195 (0.180)	0.440** (0.037)
Controls	Yes	Yes	Yes
Sector * Year Fixed Effects	Yes	Yes	Yes
City * Year Fixed Effects	Yes	Yes	Yes
<i>Pseudo R-Squared</i>	n.a.	0.109	0.200
<i>Observations</i>	18,058	10,125	9,571

Poisson and logit regressions are utilized in column 1 and 2-3 respectively where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table VI Relation between foreign bank penetration and firm innovation: Relationship lending

Dependent variable	Product Innovation	
	1	2
Share of Foreign Banks w/i 10 km	0.585*** (0.000)	
Share of Foreign Relationship Banks w/i 10 km	0.867*** (0.000)	1.452*** (0.000)
Share of Foreign Transaction Banks w/i 10 km		0.585*** (0.000)
Number of Bank Branches w/i 10 km	-0.324* (0.081)	-0.324* (0.081)
HHI of Banks w/i 10 km	0.209* (0.085)	0.209* (0.085)
Controls	Yes	Yes
Sector * Year Fixed Effects	Yes	Yes
City * Year Fixed Effects	Yes	Yes
<i>Pseudo R-Squared</i>	0.215	0.215
<i>Observations</i>	18,058	18,058

Logit regressions are utilized where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table VII Relation between foreign bank penetration and firm innovation: Heterogeneity

Dependent variable	Product Innovation			
	Non-Exporting Firm	Exporting Firm	Less Open Economy	More Open Economy
	1	2	3	4
Share of Foreign Banks w/i 10 km	1.447*** (0.000)	-0.034 (0.886)	1.389*** (0.000)	0.307 (0.125)
Number of Bank Branches w/i 10 km	-0.394* (0.098)	-0.300 (0.352)	-0.571*** (0.004)	1.035 (0.104)
HHI of Banks w/i 10 km	0.224 (0.124)	-0.143 (0.560)	0.164 (0.278)	0.374* (0.071)
Controls	Yes	Yes	Yes	Yes
Sector * Year Fixed Effects	Yes	Yes	Yes	Yes
City * Year Fixed Effects	Yes	Yes	Yes	Yes
<i>Pseudo R-Squared</i>	0.225	0.274	0.218	0.218
<i>Observations</i>	13,599	4,459	13,528	4,530

Logit regressions are utilized where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table VIII Relation between foreign bank penetration and firm innovation: Supply cha

Dependent variable	Product Innovation	
	Upstream Industries	Downstream Industries
	1	2
Share of Foreign Banks w/i 10 km	0.599*** (0.002)	1.241*** (0.000)
Number of Bank Branches w/i 10 km	-0.271 (0.294)	-0.410 (0.145)
HHI of Banks w/i 10 km	-0.043 (0.830)	0.266* (0.097)
Controls	Yes	Yes
Sector * Year Fixed Effects	Yes	Yes
City * Year Fixed Effects	Yes	Yes
<i>Pseudo R-Squared</i>	0.236	0.227
<i>Observations</i>	7,691	10,367

Logit regressions are utilized where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table IX Relation between foreign bank penetration and firm innovation: Real effects

Dependent variable	Number of Employee	R&D Investment
	1	2
Share of Foreign Banks w/i 10 km	0.225*** (0.000)	-0.081 (0.573)
Number of Bank Branches w/i 10 km	0.104 (0.206)	0.438* (0.056)
HHI of Banks w/i 10 km	-0.065 (0.242)	-0.123 (0.408)
Controls	Yes	Yes
Sector * Year Fixed Effects	Yes	Yes
City * Year Fixed Effects	Yes	Yes
<i>Pseudo R-Squared</i>	0.204	0.175
<i>Observations</i>	18,058	18,058

Logit regressions are utilized where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table A1 Variable definitions and sources

Variable	Definitions	Sources
<i>Firm Innovation</i>		
Product Innovation	dummy =1 if a firm has introduced new or significantly improved products or services	BEEPS IV & V
Process Innovation	dummy =1 if a firm has introduced new or significantly improved production or delivery methods	BEEPS IV & V
Organizational Innovation	dummy =1 if a firm has introduced new approaches to business practices, workplace organization, or external relations	BEEPS IV & V
Marketing Innovation	dummy =1 if a firm has introduced new marketing methods aimed at better addressing customers' needs	BEEPS IV & V
<i>Banking Market</i>		
Share of Foreign Banks w/i City/10 km	ratio of number of foreign bank branches to number of all bank branches within same city or 10 km radius circle of a firm	BEPS II
Number of Bank Branches w/i City/10 km	number of all bank branches within same city or 10 km radius circle of a firm	BEPS II
HHI of Banks w/i City/10 km	Herfindahl-Hirschmann Index of bank branches within same city or 10 km radius circle of a firm	BEPS II
Relationship (Transaction) Banks	dummy = 1 if relationship lending is (not) very important when dealing with SMEs	BEPS II
<i>Firm Characteristics</i>		
R&D Investment	dummy =1 if a firm has carried out any research and development activities	BEEPS IV & V
Export	percentage of sales that a firm export abroad	BEEPS IV & V
Firm Age	log number of years since establishment of a firm	BEEPS IV & V
Number of Employees	log number of permanent employees of a firm	BEEPS IV & V
Audited Firm	dummy = 1 if a firm had its annual financial statements checked and certified by an external auditor	BEEPS IV & V
Female Managed Firm	dummy = 1 if the top manager of a firm is female	BEEPS IV & V
Sole Proprietorship Firm	dummy = 1 if a firm is a sole proprietorship	BEEPS IV & V
Publicly Listed Firm	dummy = 1 if a firm is publicly listed in a stock exchange	BEEPS IV & V
State Owned Firm	dummy = 1 if a firm is a state-owned enterprises	BEEPS IV & V
Holding Company	dummy = 1 if a firm is established under a holding company structure	BEEPS IV & V
Subsidy	dummy = 1 if a firm received any subsidies from the national, regional or local governments or European Union	BEEPS IV & V

Finance Obstacle	= 0 to 4 with higher values indicate more severe obstacle in financing	BEEPS IV & V
Credit Constraint	dummy = 1 if a firm is discouraged from applying credit or is rejected in the loan application process	BEEPS IV & V
Foreign Techonology	dummy = 1 if a firm used anty technology liceensed from a foreign-owned company (excluding office software)	BEEPS IV & V
Past Performance	realized sales growth rate during the last three years	BEEPS IV & V

Locality Characteristics

Share of Foreign Firms	ratio of the number of foreign firms to all firms in BvD Amadeus around each firm in BEEPS	BvD Amadeus
Number of Firms	log number of all firms in BvD Amadeus around each firm in BEEPS	BvD Amadeus
KOF Economic Globalization Index	degree of economic globalization of a country where higher values indicate more openness	ETH Zurich
Credit Registry	dummy = 1 if a country has either a public credit registry or a private credit beurea in place	Various Sources

BEEPS IV & V are the fourth and fifth wave of the Business Environment and Enterprise Performance Survey.

BEPS II is the second round of the Banking Environment and Performance Survey.

BvD Amadeus is a comprehensive database of companies across Europe.

ETH Zurich is the KOF Swiss Economic Institute from ETH Zurich.

Table A2 Relation between foreign bank penetration and firm innovation: Lagged

Dependent variable	Product Innovation		
	1	2	3
Share of Foreign Banks w/i City	0.357** (0.018)	0.375** (0.014)	0.372** (0.028)
Lagged Share of Foreign Banks w/i City	0.781*** (0.000)	0.783*** (0.000)	0.670* (0.084)
Number of Bank Branches w/i City	0.056 (0.765)	0.098 (0.607)	0.488** (0.039)
HHI of Banks w/i City	0.852*** (0.000)	0.887*** (0.000)	0.263 (0.263)
Controls	No	Yes	Yes
Sector * Year Fixed Effects	No	No	Yes
Country * Year Fixed Effects	No	No	Yes
<i>Pseudo R-Squared</i>	0.021	0.097	0.167
<i>Observations</i>	6,116	6,116	6,116

Logit regressions are utilized where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table A3 Relation between foreign bank penetration and firm innovation: Unpacking different types of innovation

Dependent variable	Product Innovation		Process Innovation	Organizational Innovation	Marketing Innovation
	BEEPS IV	BEEPS V			
	1	2	3	4	5
Share of Foreign Banks w/i 10 km	1.125*** (0.000)	0.748*** (0.000)	-0.280 (0.175)	0.093 (0.645)	0.153 (0.435)
Number of Bank Branches w/i 10 km	-0.700* (0.095)	-0.171 (0.413)	-0.428* (0.052)	-0.120 (0.567)	-0.290 (0.174)
HHI of Banks w/i 10 km	0.117 (0.427)	0.245 (0.247)	-0.187 (0.369)	-0.196 (0.366)	-0.187 (0.362)
Controls	Yes	Yes	Yes	Yes	Yes
Sector * Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
City * Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
<i>Pseudo R-Squared</i>	0.155	0.192	0.180	0.196	0.189
<i>Observations</i>	8,487	9,571	9,571	9,571	9,571

Logit regressions are utilized where the coefficients are listed in the first row and robust firm clustered p-values appear in (parentheses).

Table A4 Introduction of credit registry

Country	Public Credit Registry	Private Credit Bureau
Albania	2008	2009
Armenia	2003	2004
Azerbaijan	2005	n.a.
Belarus	2007	n.a.
Bosnia & Herzegovina	2006	2001
Bulgaria	1999	2005
Croatia	n.a.	2007
Czech Republic	2002	2002
Estonia	n.a.	2001
Georgia	n.a.	2005
Hungary	n.a.	1995
Kazakhstan	1996	2006
Kyrgyz Republic	n.a.	2003
Latvia	2003	n.a.
Lithuania	1995	2003
North Macedonia	1998	2010
Moldova	n.a.	2011
Mongolia	1996	n.a.
Montenegro	2008	n.a.
Poland	n.a.	2001
Romania	2000	2004
Serbia	2002	2004
Slovak Republic	1997	2004
Slovenia	1994	2008
Tajikistan	n.a.	2013
Turkey	1951	1997
Ukraine	n.a.	2007

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